Claims

1) Peptide containing less than 50 amino acids, comprising at least one dimer of the type XG, wherein X stands for a N^G-mono- or N^G-N^G-dimethylated arginine, that is able to react with antibodies and with said methylation being crucial for the reaction between said peptide and said antibodies and wherein said antibodies are present in sera from patients with:

- systemic lupus erythematosus, or
- infectious, recurrent or chronic mononucleosis or infection, or
- certain cancers which are related to infection with Epstein-Barr virus, such as Burkitt's lymphoma or nasopharyngeal carcinoma.

2) Peptide according to claim 1 comprising the amino acid sequence
GXGXGXGXGXGXGXGXG (SEQ ID NO 1) or,
AXGXGXGMGXG (SEQ ID NO 2) or,
KAQVAAXGXGXGMGXGN (SEQ ID NO 3) or,
DVEPKVKSKKREAVAGXGXGXGXGXGXGXGXGGPRR (SEQ ID NO 4) or,
DNHGXGXGXGXGGG (SEQ ID NO 5) or,
GGXGXGGSGGXGXGG (SEQ ID NO 6) or,
ERAXGXGXGXGE (SEQ ID NO 7) or,
GGQQDXGGXGXGGGGGYNXSSGGYEPXGXGGGXGGXGGMGGSDXGG (SEQ ID NO 8) or,
GGQQDXGGXGXGGGGGYN (SEQ ID NO 9) or,
SGGYEPXGXGGGXGGXGGMGGSDXGG (SEQ ID NO 10) or,
DFNXGGGNGXGGXGXGG (SEQ ID NO 11) or,
DFNXGGGNGXGGXGXGGPMGXGGYGGGGS (SEQ ID NO 12) or,
GDDXXGXGGYDXGGYXGXGGDXGGFXGGXGGGDXGGFG (SEQ ID NO 13) or,
GDDXXGXGGYDXGG (SEQ ID NO 14) or,
GGYXGXGGDXGGFXGGXGGGDXGGFG (SEQ ID NO 15) or,
an analog of said peptides comprising conservative amino acid substitutions.

3) Peptide and/or chemical structure comprising any of the peptides according to claims 1 or 2, fused to a linker molecule.

4) Circularized peptide that comprises at least one of the peptides according to any of the claims 1 to 3.

5) Peptide comprising and/or consisting of tandem repeats of at least two of any of the peptides of claims 1 to 4.

6) Branched peptide that comprises at least one of the peptides according to any of the claims 1 to 5.

7) Method for producing a peptide according to any of claims 1 to 6, by classical chemical synthesis, wherein methylated arginines are substituted for unmethylated arginine residues during the chemical synthesis.

8) Method for producing a peptide according to any of claims 1 to 6, wherein the primary amino acid sequence is produced by classical chemical synthesis, and wherein the arginine residues that precede glycine residues are subsequently methylated by contacting said peptide with a protein arginine methyltransferase.

9) Method for producing a peptide of any of claims 1 to 6 comprising the following steps:

-transforming an appropriate cellular host with a recombinant vector in which a polynucleic acid is inserted comprising the sequence that codes for said peptide under the control of the appropriate regulatory elements such that said peptide or a protein comprising said peptide is expressed and/or secreted,

-culturing said transformed cellular host under conditions allowing expression of said protein or peptide and allowing a partial or optimal methylation of the arginines present in said peptide,

-harvesting said peptide.

10) Method for producing a peptide of any of claims 1 to 6 comprising the following steps:
-transforming an appropriate cellular host with a recombinant vector in which a polynucleic acid is inserted comprising the sequence that codes for said peptide under the control of the appropriate regulatory elements, such that said peptide or a protein comprising said peptide is expressed and/or secreted,
-culturing said transformed cellular host under conditions allowing expression of said protein or said peptide,
-harvesting said protein or said peptide,
-methylating arginine residues of said protein or said peptide by contacting with a protein arginine methyltransferase.

11) Method according to any of claims 9 or 10, wherein said host cell is a bacterial host or yeast or any other eukaryotic host cell which is preferably transformed with a recombinant baculovirus.

12) An antibody raised upon immunization with a peptide according to any of the claims 1 to 6, with said antibody being specifically reactive with the methylated forms of said peptide, and with said antibody being preferably a monoclonal antibody.

13) Anti-idiotype antibody raised upon immunization with an antibody according to claim 12, with said anti-idiotype antibody being specifically reactive with the antibody of claim 12, thereby mimicking the methylated form of a peptide according to any of claims 1 to 6, and with said antibody being preferably a monoclonal antibody.

14) An immunotoxin molecule comprising and/or consisting of cell recognition molecule being a peptide of any of claims 1 to 6, or an antibody according to any of the claims 12 or 13, covalently bound to a toxin molecule or active fragment thereof.

15) A peptide according to any of the claims 1 to 6 or an antibody according to any of claims 12 or 13 or an immunotoxin molecule according to claim 14 or a composition thereof for use as a medicament.

16) Use of a peptide according to any of claims 1 to 6 or an antibody according to any of claims 12 or 13 or an immunotoxin molecule according to claim 14 or a composition thereof for the preparation of a medicament or of a diagnosticum for auto-immune diseases such as:

-systemic lupus erythematosus,
-discoid lupus erythematosus,
-scleroderma,
-dermatomyositis,
-rheumatoid arthritis,
-Sjögren's syndrome.

or for diseases in which Epstein-Barr can be implicated such as:

-Burkitt's lymphoma,
-nasopharyngeal carcinoma,
-infectious, recurrent or chronic mononucleosis,

17) Use of a polypeptide according to claim 1 to 6 or a composition thereof for the preparation of a medicament to treat auto-immune diseases by increasing the size of antigen-immune complexes, thereby improving the clearance of the formed immune complexes.

18) Use of a polypeptide according to claim 1 to 6 or a composition thereof for the preparation of a medicament for oral administration to treat auto-immune diseases by inducing a state of systemic hyporesponsiveness to the said polypeptide ('Oral tolerance').

19) A diagnostic kit for use in detecting auto-immune diseases such as:

-systemic lupus erythematosus,

-discoid lupus erythematosus,

-scleroderma,

-dermatomyositis,

-rheumatoid arthritis,

-Sjögren's syndrome,

or for detecting diseases in which Epstein-Barr can be implicated such as:

-Burkitt's lymphoma,

-nasopharyngeal carcinoma,

-Hodgkin's disease,

-infectious, recurrent or chronic mononucleosis,

said kit comprising at least one peptide according to any of claims 1 to 6, or an antibody according to claims 12 or 13, with said peptide or antibody being possibly bound to a solid support.

20) A diagnostic kit according to claim 19, said kit comprising a range of peptides according to any of claims 1 to 6 or of antibodies according to claims 12 or 13, possibly in combination with native methylated SmD1 or SmD3 and recombinant unmethylated SmD1 or SmD3, wherein said peptides are attached to specific locations on a solid substrate.

21) A diagnostic kit according to claim 19 or 20, wherein said solid support is a membrane strip and said polypeptides are coupled to the membrane in the form of parallel lines.

-natural SmD (1,2 or 3) or in vitro dimethylated SmD (1,2 or 3)

-unmethylated SmD expressed in E.coli (1,2 or 3)

-peptide of any of claims 1 to 6

22) A diagnostic kit according to any of claims 19 to 21 wherein certain peptides are not attached to a solid support but are provided in the binding solution to be used as competitors and/or to block other antibodies that are present in sera from patients with autoimmune disease other than SLE, thereby decreasing or

eliminating possible cross-reaction and/or aspecific binding.

add a3

add D8